## Overview
**HP EliteBook 850 G2 Notebook PC**
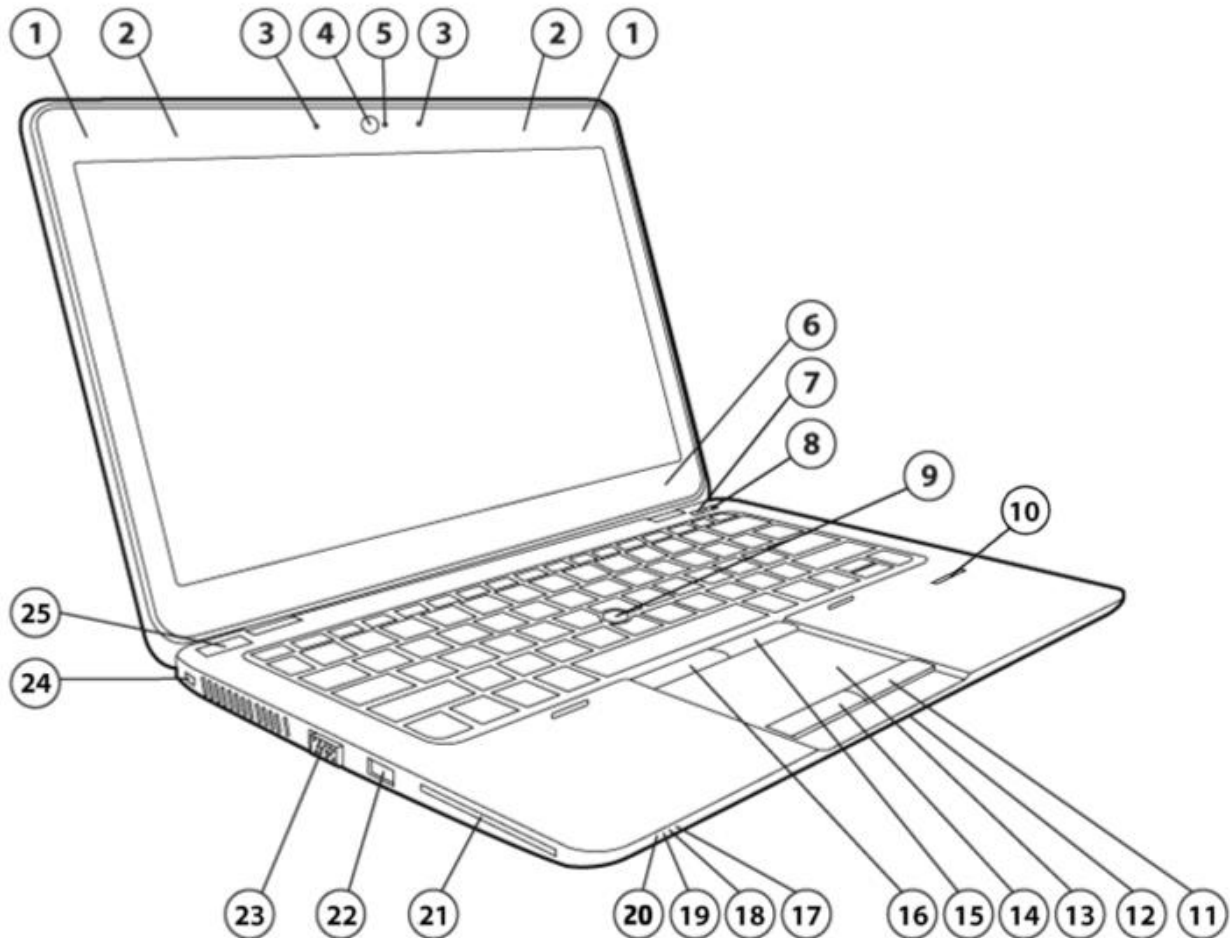


**Front/Left**

| | | | |
|---|---|---|---|
| 1. | WLAN antennas (2) | 14. | Left TouchPad button |
| 2. | WWAN antennas (2) | 15. | Right pointing stick button |
| 3. | Internal microphones (2) | 16. | Left pointing stick button |
| 4. | Webcam (select models only) | 17. | Hard drive light |
| 5. | Webcam light (select models only) | 18. | AC adapter/Battery light |
| 6. | Internal display switch | 19. | Power light |
| 7. | Wireless button | 20. | Wireless light |
| 8. | Volume mute button | 21. | Smart card reader |
| 9. | Pointstick | 22. | USB 3.0 port |
| 10. | Fingerprint reader (optional) | 23. | External VGA monitor port |
| 11. | Right TouchPad button | 24. | Security cable slot |
| 12. | NFC sensor (optional) | 25. | Power button |
| 13. | TouchPad zone | | |
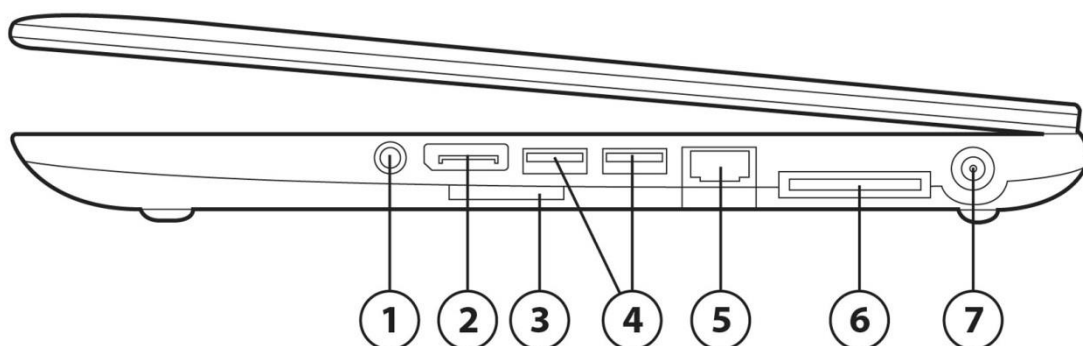
**Right**

1. Audio-out (headphone) jack/Audio-in(microphone) jack
2. DisplayPort
3. Memory card reader
4. USB 3.0 ports (2)
5. Drop-jaw Ethernet port (RJ-45)
6. Docking port
7. Power connector
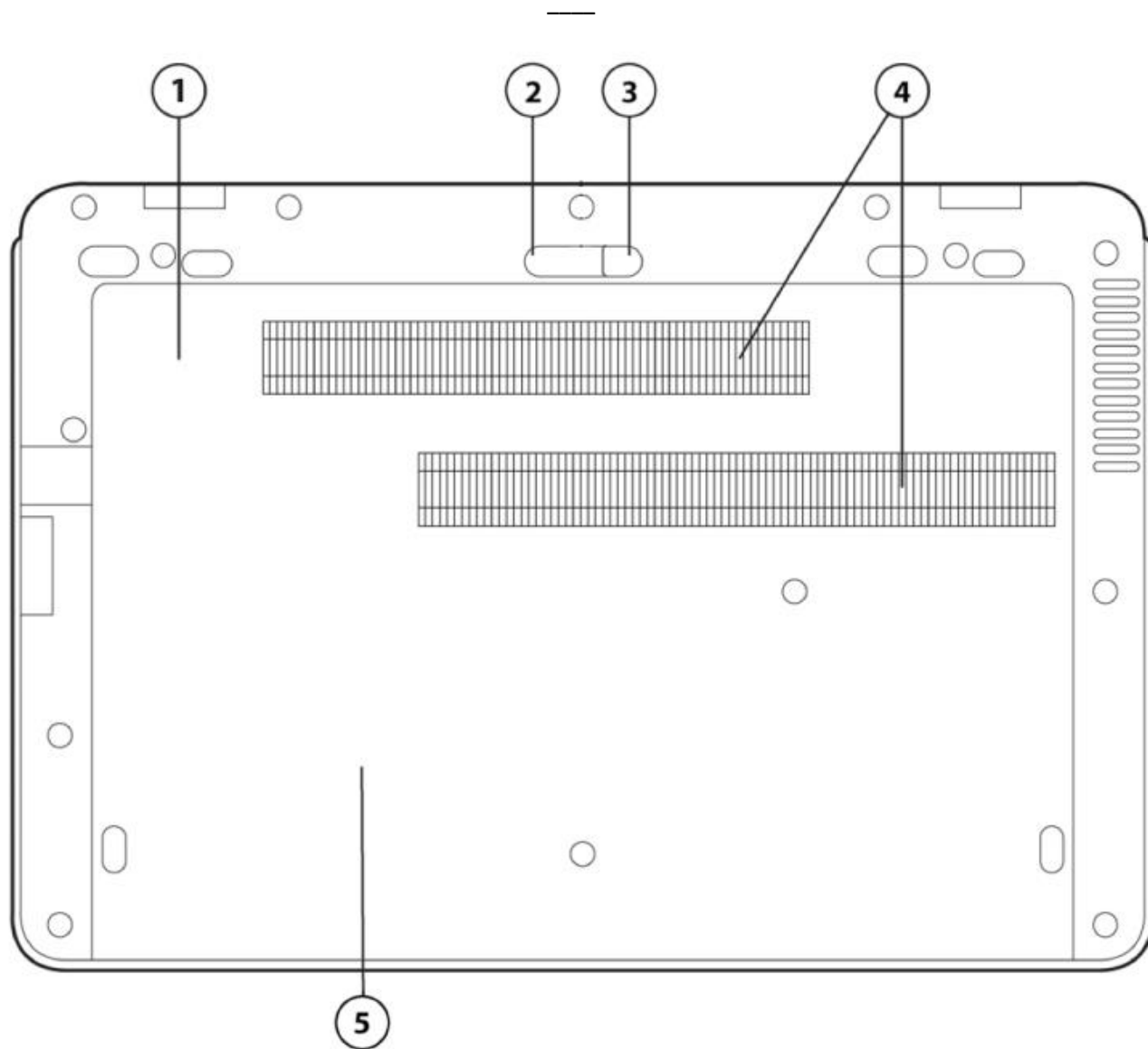
**Bottom**

1. EasyAccess panel
2. EasyAccess panel release latch
3. Security screw
4. Vents (2)
5. SIM slot (inside the panel)*

## AT A GLANCE

- Windows 8.1 , Windows 7 , Ubuntu Linux or FreeDOS 2.0
- Magnesium and aluminum chassis, HP DuraFinish, HP DisplaySafe frame, HP duraKeys, precision aluminum drop hinge, aluminum palm rest
- 4-step Soft-touch paint process
- Patent-pending Drop-jaw Ethernet port
- EasyAccess door to quickly access most components for easy serviceability
- Full-sized spill-resistant keyboard; optional back-lit keyboard keeps you productive in low-light settings
- Choice of 5th Generation Intel® Core™ i7 and i5 processors
- Memory options up to 16 GB
- Weight starting at 4.15 lb/1.88 kg
- Storage options up to 1 TB Hard Drives, 512 GB Solid State Drives, or 256GB PCIe Solid State Drive
- M.2 32GB Flash Cache for Intel Smart Response Technology installed in the factory
- M.2 120GB Solid State Drive & 256GB PCIe Solid State Drive can be configured as primary storage or combined with a SATA drive for dual storage performance
- Integrated Intel® HD Graphics 5500  or AMD Radeon™ R7 M260X discrete graphics with 1 GB dedicated GDDR5 video memory
- Choice of Touch or Non Touch 15.6” diagonal displays
- Easily hot dock with the 2013 UltraSlim Docking Station
- DisplayPort for high resolution support
- Touchpad with scroll zone, on/off button with LED indicator
- Enhanced security features including HP Sure Start self-healing BIOS, HP Client Security and optional HP Fingerprint Reader
- Optional HD webcam with dual-microphone array for video conferencing
- HD Audio with DTS Studio Sound™  optimized for high fidelity audio
- Wireless and speaker mute buttons
- Supports a broad range of wireless LAN and wireless WAN options, including 4G LTE, for connectivity on the go.
- UEFI BIOS Compliant with 2.3.1 UEFI Specification

**NOTE: See important legal disclosures for all listed specs in their respective features sections.**

## PRODUCT NAME

## HP ELITEBOOK 850 G2 NOTEBOOK PC

## OPERATING SYSTEM

**Preinstalled**
Windows 8.1 Pro 64*
Windows 8.1 64*
Windows 7 Professional 64 (available through downgrade rights from Windows 8.1 Pro 64)**
Windows 7 Professional 32 (available through downgrade rights from Windows 8.1 Pro 64)**
Windows 7 Professional 32*
Windows 7 Professional 64*
Ubuntu Linux
FreeDOS 2.0

**Web-only Support**
Windows 8.1 Enterprise 64*
Windows 8 Chinese Market 64*
Windows 8 Emerging Markets 64*
Windows 8 Multi-Language 64*
Windows 8 Professionals 64*
Windows 7 Enterprise 32*
Windows 7 Enterprise 64*

* Not all features are available in all editions or versions of Windows. Systems may require upgraded and/or separately purchased hardware, drivers and/or software to take full advantage of Windows functionality. See http://www.microsoft.com for details.
** This system is preinstalled with Windows 7 Pro software and also comes with a license and media for Windows 8 Pro software. You may only use one version of the Windows software at a time. Switching between versions will require you to uninstall one version and install the other version. You must back up all data (files, photos, etc.) before uninstalling and installing operating systems to avoid loss of your data.

## PROCESSOR

5$^{th}$ Generation Intel® Core™ i3-5010U 2.1-GHz 3-MB L3 Cache, 15W
5$^{th}$ Generation Intel® Core™ i5-5200U 2.2-GHz (max turbo frequency 2.7-GHz), 3 MB L3 cache, 15W
5$^{th}$ Generation Intel® Core™ i5-5300U 2.3-GHz (max turbo frequency 2.9-GHz), 3 MB L3 Cache, 15W
5$^{th}$ Generation Intel® Core™ i7-5500U 2.4-GHz (max turbo frequency 3.0-GHz), 4 MB L3 Cache, 15W
5$^{th}$ Generation Intel® Core™ i7-5600U 2.6-GHz (max turbo frequency 3.2-GHz), 4 MB L3 Cache, 15W

* Multi-Core is designed to improve performance of certain software products. Not all customers or software applications will necessarily benefit from use of this technology. 64-bit computing on Intel® architecture requires a computer system with a processor, chipset, BIOS, operating system, device drivers, and applications enabled for Intel® 64 architecture. Processors will not operate (including 32-bit operation) without an Intel® 64 architecture-enabled BIOS. Performance will vary depending on your hardware and software configurations. Intel's numbering is not a measurement of higher performance.
** Not available with Intel iAMT (*Not available with vPro)
**NOTE**: Processor speed denotes maximum performance mode; processors will run at lower speeds in battery optimization mode.

## INTEL TURBO BOOST TECHNOLOGY*

Intel Turbo Boost is a feature that speeds up the CPU for a short time. It is similar to overclocking the processor, except within a framework provided by Intel. This feature provides additional performance and allows the computer to perform certain tasks more quickly. It also draws additional power and generates additional heat. Therefore, if Turbo Boost is used while powered from battery, it causes additional stress on the battery.

Using Turbo Boost while powered from battery might impact battery cycle life. Cycle life describes how long the battery will last before it needs to be replaced. A cycle refers to one complete charge/discharge cycle of the battery. Because Turbo Boost causes extra stress on the battery, it often shortens the lifetime of the battery.

HP decided not to enable Turbo Boost when powered from battery. This decision was based on the desire to give customers the greatest battery cycle life possible. Turbo Boost is enabled when powered from AC adapter.

Based on customer requests, HP will provide an option to enable Turbo Boost while powered from battery. For the 2013 platform, it will be an F10 option. Turbo Boost will be available for devices powered from battery by the end of the year. The additional performance might cause a slight reduction in battery cycle life, but will not void the battery warranty.

*Implementing Turbo Boost in F10 option is only allowed for batteries over 40WHr. Intel® Turbo Boost technology requires a PC with a processor with Intel Turbo Boost capability. Intel Turbo Boost performance varies depending on hardware, software and overall system configuration. See www.intel.com/technology/turboboost for more information.

## CHIPSET

Chipset integrated with processor

## INTEL CORE I5 WITH VPRO/CORE I7 WITH VPRO TECHNOLOGY CAPABLE

Intel Core i5 with vPro and Core i7 with vPro technology is a selectable feature that is available on units configured with select processors, an Intel Centrino® Advanced-N or Ultimate-N WLAN module and a preinstalled Windows operating system. It provides advances in remote manageability, security, energy efficient performance, and wireless connectivity. Intel Active Management Technology 9.0 (iAMT) offers built-in manageability and proactive security for networked notebook PCs, even when they are powered off* or when the operating system is inoperable. It can help identify threats before they reach the network, isolate infected systems, and update PCs regardless of their power state.
*Requires a Windows operating system, network hardware and software, connection with a power source, and a direct (non-VPN) corporate network connection which is either cable or wireless LAN.

**NOTE**: Some functionality of this technology, such as Intel® Active management technology and Intel Virtualization technology, requires additional 3rd party software in order to run.  Availability of future "virtual appliances" applications for Intel vPro technology is dependent on 3rd party software providers. Microsoft Windows required.

## GRAPHICS

Integrated:
Intel® HD* Graphics 5500
Discrete
AMD Radeon™ R7 M260X*, with 1 GB dedicated DDR5 video memory**

*HD content required to view HD images.

**AMD Dynamic Switchable Graphics technology requires an Intel processor, plus an AMD Radeon™ discrete graphics configuration and is not available on FreeDOS and Linux OS. With AMD Dynamic Switchable Graphics technology, full enablement of all discrete

graphics video and display features may not be supported on all systems (e.g. OpenGL applications will run on the integrated GPU or the APU as the case may be).

## DISPLAY

**Internal**
**Non Touch**
15.6" diagonal LED-backlit HD anti-glare SVA flat (1366x768)
15.6" diagonal LED-backlit HD anti-glare SVA flat (1366x768) with camera
15.6" diagonal LED-backlit FHD anti-glare SVA Slim (1920x1080)
15.6" diagonal LED-backlit FHD anti-glare SVA Slim (1920x1080) with camera

**Touch**
15.6" FHD diagonal LED-backlit SVA Slim (1920x1080) with camera

Touch panel has chemically-strengthened Corning® Gorilla® Glass 3 top cover

**External**
Up to 32-bit per pixel color depth

**VGA**
Port supports resolutions up to 1920 x 1200 external resolution@75 Hz

**DisplayPort**
Supports resolutions up to 3840 x 2160 @ 60Hz. Supports Multi-Stream Transport (MST) where three displays can be daisy chained with digital displays through DisplayPort Only. The full resolution of each display will be limited as you reach 3 displays due to the bandwidth limitations with a maximum resolution of:

- 2560x1600@60Hz for 2 displays
- 1920x1200@60Hz for 3 displays

**Number of Displays supported**
3 With Optional 2013 UltraSlim Docking Station
Sold separately.

## STORAGE AND DRIVES

**Primary Storage Bay**
**Hard Drives***
320 GB 7200rpm SATA Hard Drive
500 GB 7200rpm SATA Hard Drive
500 GB 7200rpm Self-Encrypting Drive
500 GB 5400rpm Self-Encrypting Drive (FIPS-140-2)
1TB 7200rpm SATA Hard Drive

**Solid State Drive***
120 GB M.2 Solid State Drive
128 GB SATA-3 Solid State Drive
180 GB SATA-3 Solid State Drive
180 GB SATA-3 Self-Encrypting Drive
240 GB SATA-3 Solid State Drive
256 GB SATA-3 Solid State Drive

256 GB SATA-3 Self-Encrypting Drive
256 GB M.2 PCIe Solid State Drive
512 GB SATA-3 Solid State Drive

**HP 3D DriveGuard (Windows only)**
HP 3D DriveGuard mitigates the risk of hard drive failures, safeguarding your data when you are on the go by sensing sudden movement and protecting the hard drive.  The hard drive is mounted directly to the notebook frame, reducing the transmission of shock to the hard drive.

*For hard drives and solid state drives, GB = 1 billion bytes. TB = 1 trillion bytes.  Actual formatted capacity is less.  Up to 16 GB (for Windows 7) and 30 GB (for Windows 8) of system disk is reserved for the system recovery software.

## FLASH CACHE

32 GB M.2 (NGFF)
Optional 32 GB M.2 flash cache module support for Intel Smart Response Technology.
Available only with standard non-SED hard drive.

## MEMORY

**Standard**
DDR3L SDRAM (1600 MHz)
Two SODIMM slots supporting dual-channel memory
4 GB Total System Memory (4 GB x 1)
8 GB Total System Memory (4 GB x 2) (Not available with Windows 7 Professional 32)
8 GB Total System Memory (8 GB x 1) ) (Not available with Windows 7 Professional 32)
16 GB Total System Memory (8 GB x 2) ) (Not available with Windows 7 Professional 32)

**Maximum**
Upgradeable to 16 GB with optional 8 GB SODIMMs in slots 1 and 2*

**Dual-channel**
Maximized dual-channel performance requires SODIMMs of the same size and speed in both memory slots.

* Maximum memory capacities assume Windows 64-bit operating systems or Linux. With Windows 32-bit operating systems, memory above 3 GB may not all be available due to system resource requirements.
**NOTE:** Due to the non-industry standard nature of some third-party memory modules, we recommend HP branded memory to ensure compatibility. If you mix memory speeds, the system will perform at the lower memory speed.

## NETWORKING/COMMUNICATIONS

**Wireless**
Support for a broad range of secure, integrated wireless LAN and wireless WAN options featuring support for the latest industry standards. Broadband Wireless (WWAN) requires a Windows operating system and is available in select countries as a standard, factory configurable feature only. Integrated Bluetooth is also available (factory configurable only) and can be combined with any of the supported wireless LAN and wireless WAN options.

**Broadband Wireless (WWAN)***
HP lt4112 LTE/HSPA+ Qualcomm® Gobi™ 4G Module
HP lt4211 LTE/EV-DO/HSPA+ Qualcomm® Gobi™ 4G Module
HP hs3110 HSPA+ Mobile Broadband Module

* WWAN is an optional feature sold separately or as an add on feature. WWAN connection requires wireless data service contract, network support, and is not available in all areas. Contact service provider to determine the coverage area and

availability. Connection speeds will vary due to location, environment, network conditions, and other factors.
** 4G LTE WWAN is an optional feature, not available on all products, in all regions and requires separately purchased service contract. Check with service provider for coverage and availability. Connection speeds will vary due to location, environment, network conditions, and other factors.

**Wireless LAN (WLAN)\***
Intel® Dual Band Wireless-AC 7265 802.11 ac (2X2) Wi-Fi + Bluetooth®
Intel® Dual Band Wireless-7265AN 802.11 a/b/g/n (2X2) Wi-Fi + Bluetooth®
Intel® Dual Band Wireless-AC 3160 802.11 ac (1x1) Wi-Fi + Bluetooth®

*Wireless access point and Internet service is required and is not included.  Availability of public wireless access points limited.

**Communications**
Intel® I218LM Gigabit* Network Connection (10/100/1000 NIC)
* The term "10/100/1000" or "Gigabit" Ethernet indicates compatibility with IEEE standard 802.3ab for Gigabit Ethernet, and does not connote actual operating speed of 1 Gb/s. For high-speed transmission, connection to a Gigabit Ethernet server and network infrastructure is required.

Optional Near Field Communication (NFC)

## AUDIO/MULTIMEDIA

**Audio**
HD Audio with DTS Studio Sound™
2 Integrated stereo speakers
Integrated dual-microphone array; located in the display
Function keys for microphone mute, volume up, volume down
Stereo headphone/line out
Stereo microphone/line in

**Webcam**
Optional* 720p HD** webcam

- HD format (widescreen)
- Supports videoconferencing (non-HD) and still image capture
- High quality fixed focus lens
- Video capture at various resolutions up to 1280x720 resolution (720p) and up to 30fps
- M-JPEG compression supports higher frame rates for video capture and videoconferencing
- Improved low light sensitivity
- Improved dynamic range
- Skype-ready ***

*Sold separately or as an optional feature.
** HD content required to view HD images.
***Internet access required.

## KEYBOARDS/POINTING DEVICES/BUTTONS & FUNCTION KEYS

**Keyboard**
The HP spill-resistant keyboard is designed using a thin layer of Mylar film under the keyboard and includes an all-metal keyboard deck for greater rigidity, as well as HP DuraKeys. The 101/102-key compatible keyboard features a full-pitch key

layout with desktop keyboard features, such as editing keys, both left and right control and alt keys, and function keys. US and International key layouts are available. Backlit keyboard available as an option.

**Pointing Devices**
Touchpad with scroll zone, on/off button with LED indicator, two-way scroll, two pick buttons

**Buttons and Function Keys**
Separate discrete buttons provide easy access to WLAN on/off and speaker mute. Function keys provide control of features including: standby mode, display brightness, external display, microphone mute, volume down, and volume up.

\* In independent testing conducted by Trace Laboratories, HP DuraKeys showed no wear after 250,000 cycles. Competitor notebooks showed significant wear after only 5,000 cycles.)

# SOFTWARE AND SECURITY

**Preinstalled Software with Windows Operating System**

**BIOS**
HP BIOSphere\*
HP Sure Start
HP DriveLock | HP Automatic Drive Lock
HP BIOS Protection\*\*\*
HP Disk Sanitizer \*\*\*\*
HP SpareKey\*\*\*\*\*
Update via Network
Master Record Security
Power On Authentication
Pre-Boot Security
Secure Erase\*\*\*\*\*\*
Hybrid Boot
Measured Boot
Secure Boot
Absolute Persistence Module\*\*\*\*\*\*\*

\* Available only on business PCs with HP BIOS.
 \*\*\* May require a manual recovery step if all copies of BIOS are compromised or deleted.
\*\*\*\* For the use cases outlined in the DOD 5220.22-M Supplement.Does not support solid state drives.
\*\*\*\*\* Requires initial user set up.
\*\*\*\*\*\* For the methods outlined in the National Institute of Standards and Technology Special Publication 800-88.
\*\*\*\*\*\*\* Absolute agent is shipped turned off, and will be activated when customers activate a purchased subscription. Subscriptions can be purchased for terms ranging multiple years. Service is limited, check with Absolute for availability outside the U.S.  The Absolute Recovery Guarantee is a limited warranty. Certain conditions apply. For full details visit: http://www.absolute.com/company/legal/agreements/computrace-agreement.  Data Delete is an optional service provided by Absolute Software. If utilized, the Recovery Guarantee is null and void. In order to use the Data Delete service, customers must first sign a Pre-Authorization Agreement and either obtain a PIN or purchase one or more RSA SecurID tokens from Absolute Software.

**MultiMedia**
CyberLink PowerDVD
CyberLink YouCam BE

**Communication**
HP Connection Manager (Windows 7 only)

HP GPS and Location*
HP Mobile Connect (Windows 8 only)**
HP Wireless Hotspot*** (Windows 8 only)
Intel WiDi Software****
Intel My WiFi and Wireless Drivers

**HP Value Add Software**
Getting Started with Windows 8
HP 3D DriveGuard (Windows required)
HP ePrint Driver (HP Exclusive)*****
HP Hotkey Support
HP PageLift
HP Recovery Manager (Windows 7 only)
HP Support Assistant
HP Recovery Disc Creator (Windows 7 only)
UEFI System Diagnostics W8

**3rd Party**
Adobe® Flash Player (Commercial)
Foxit PhantomPDF Express for HP
Bing Search
Skype******
Buy Office

**NOTE:** HP Recovery Manager enables fast recovery of the factory preinstalled image if the system becomes corrupted or if important system files are accidentally deleted. Up to 16 GB (for Windows 7) and 36 GB (for Windows 8) of system disk is reserved for the system recovery software.

*GPS access requires an unobstructed path to multiple satellites. Performance may be affected if/when used inside of buildings, bridges or heavily congested metropolitan areas. Requires separately purchased GPS navigation software available from multiple GPS applications.
** HP Mobile Connect is only available on selective devices with wwan. For geographical availability refer to www.hp.com/go/mobileconnect
***The wireless hotspot application requires an active internet connection that is shared with the connecting devices. Wireless hotspot data usage may incur additional charges. Check with your service provider for plan details.
**** Integrated Intel Wi-Di feature is available on select configurations only and requires separately purchased projector, tv or computer monitor with an integrated or external Wi-Di receiver. External Wi-Di receivers connect to the projector, tv or computer monitor via a standard HDMI cable, also sold separately.
*****Requires an Internet connection to HP web-enabled printer and HP ePrint account registration (for a list of eligible printers, supported documents and image types and other HP ePrint details, see www.hp.com/go/businessmobileprinting.
****** Skype is not offered in China.

**Manageability**
HP Driver Packs *
HP SoftPaq Download Manager (SDM)*
HP System Software Manager (SSM)*
HP BIOS Config Utility (BCU) *
HP Client Catalog / HP CIK for Microsoft SCCM *
LANDESK Management *

*  Not preinstalled
For more information on HP Client Management Solutions refer to: http://www.hp.com/go/clientmanagement.

**Standard Security Features**
HP Client Security with Credential Manager and Password Manager (Windows only)
HP Device Access Manager with Just in Time Authentication
HP Drive Encryption (FIPS 140-2 certified)*
HP File Sanitizer**
Microsoft Security Essentials (Windows 7 only)***
Central Management of Client Security Credential Manager with DigitalPersona Pro Workgroup*****
Computrace Support

**Security Hardware**
TPM 2.0
Security lock slot
Fingerprint Reader
Integrated Smart Card Reader

**NOTE:** The Absolute Persistence agent is shipped turned off, and must be activated by customers when they purchase a subscription. Subscriptions can be purchased for terms ranging multiple years. Service is limited, check with Absolute for availability outside the U.S.

* Requires Windows. Data is protected prior to Drive Encryption login. Turning the PC off or into hibernate logs out of Drive Encryption and prevents data access.
** For the use cases outlined in the DOD 5220.22-M Supplement. Supports standard Hard Drives. Initial setup required.
*** Opt in and internet connection required for updates.
***** In order to deploy and receive updated policies, the client needs to be connected to the network server and requires separately purchased DigitalPersona Pro software. System access may not prevent users from logging into the system on the first attempt if policy updates haven't yet been received and applied. Not all features are remotely manageable.
******** Intel Anti-Theft security is supported on Intel Core i processors and requires a separately purchased Absolute Computrace service subscription and must be activated and configured.  Check with Absolute for availability in your country. Intel and HP assume no liability for lost or stolen data and/or systems or any other damages resulting therefrom. See http://www.intel.com/technology/anti-theft/.
********* Intel Identity Protection feature is only available with Intel Core Processors. Intel® IPT security requires separate Symantec VIP software service subscription and must be activated and configured.  Requires a website that uses Symantec VIP Authentication Service and Microsoft® Windows.  Intel® and HP assume no liability for lost or stolen data and/or systems or any other damages resulting therefrom.

For more information on HP security solutions refer to: http://www.hp.com/go/protecttools.

# POWER

**Power Supply**
HP 45W Smart AC Adapter
45W 2-prong 7.4mm DC jack AC Adapter (Only for Japan)
HP 65W Smart AC Adapter
HP 65W Smart EM AC Adapter (China and India only)
Power cord is configurable; either  3.2 feet or 6 feet (1.0 or 1.8 meter)
Total length including external AC adapter is 9.2 feet or 12 feet (2.86 or 3.66 meter).

**Primary Battery**
3-cell HP Long Life Polymer 24 WHr
3-cell HP Long Life Polymer 50 WHr

**Battery Life***

TBD

**System Standby Time\*\***
TBD

**Power Conservation**
Supports enhanced Intel SpeedStep technology (allows Battery Optimized Mode, Maximum Performance Mode, or Automatic mode)
AMD PowerPlay technology (discrete models)
Hibernation
Standby
ACPI compliance

# WEIGHTS & DIMENSIONS

**Weight**
**Non Touch**
Starting at 4.02 lb/1.83 kg
Weight will vary by configuration.
3-cell (24Whr) battery, HD panel, UMA, no FPR, one SODIMM, WLAN, lightest M.2 SSD primary storage module, no camera, no WWAN

**Touch**
Starting at 4.02 lb/1.83 kg
Weight will vary by configuration.
3-cell (24Whr) battery, FHD Touch panel, UMA, no FPR, one SODIMM, WLAN,  lightest M.2 SSD primary storage module, no camera, no WWAN

**Dimensions** (w x d x h)
**Non Touch**
14.78 x 9.98 x 0.84 in (at front)
37.55 x 25.36 x 2.14 cm (at front)

**Touch**
14.78 x 9.98 x 1.02 in (at front)
37.55 x 25.36 x 2.58 cm (at front)

# PORTS/SLOTS

**Ports**
(1) DisplayPort 1.2
(1) USB 3.0 Charging Port
(3) USB 3.0 Port
(1) RJ-45 / Ethernet
(1) Side Docking connector
(1) Secondary battery connector
(1) Headphone/Microphone Combo
(1) AC Port

**Expansion Slots**
Media Card Reader
Supports SD, SDHC, SDXC

# SERVICE AND SUPPORT

HP Services offers 3-year, 1-year and 90 day limited warranty options depending on country. Batteries have a default one year limited warranty except for Long Life batteries which will have same 1-year or 3-year limited warranty as the platform. On-site service and extended coverage is also available. HP Care Pack Services are optional extended service contracts that go beyond the standard limited warranties.* To choose the right level of service for your HP product, use the HP Care Pack Services Lookup Tool at: http://www.hp.com/go/cpc.

**NOTE:** Certain restrictions and exclusions apply. Consult the HP Customer Support Center for details.
http://h20000.www2.hp.com/bizsupport/TechSupport/ProductRoot.jsp

*HP Care Packs are sold separately. Service levels and response times for HP Care Services may vary depending on your geographic location.  Service starts on date of hardware purchase.  Restrictions and limitations apply.  Consult the HP Customer Support Center for details. http://h20000.www2.hp.com/bizsupport/TechSupport/ProductRoot.jsp

## SYSTEM UNIT

| | | | |
|---|---|---|---|
| **Stand-Alone Power Requirements** (AC Power) | **Nominal Operating Voltage** | 19.5 V | |
| | **Average Operating Power** | **Windows 7 (64-bit)** | **Windows8.1 (64-bit)** |
| | Integrated graphics | 4.75 W | 4.26 W |
| | **Max Operating Power** | Discrete < 90W | |
| | | UMA < 65W | |
| **Temperature** | **Operating** | 32° to 95° F (0° to 35° C) (not writing optical) | |
| | | 41° to 95° F (5° to 35° C) (writing optical) | |
| | **Non-operating** | -4° to 140° F (-20° to 60° C) | |
| **Relative Humidity** | **Operating** | 10% to 90%, non-condensing | |
| | **Non-operating** | 5% to 95%, 101.6° F (38.7° C) maximum wet bulb temperature | |
| **Shock** | **Operating** | 40 G, 2 ms, half-sine | |
| | **Non-operating** | 200 G, 2 ms, half-sine | |
| **Random Vibration** | **Operating** | 0.75 grms | |
| | **Non-operating** | 1.50 grms | |
| **Altitude** (unpressurized) | **Operating** | -50 to 10,000 ft (-15.24 to 3,048 m) | |
| | **Non-operating** | -50 to 40,000 ft (-15.24 to 12,192 m) | |
| **Planned Industry Standard Certifications** | **UL** | Yes | |
| | **CSA** | Yes | |
| | **FCC Compliance** | Yes | |
| | **ENERGY STAR®** | Select models* | |
| | **EPEAT®** | Registered Gold in United States** | |
| | **ICES** | Yes | |
| | **Australia / NZ A-Tick Compliance** | Yes | |
| | **CCC** | Yes | |
| | **Japan VCCI Compliance** | Yes | |
| | **KC** | Yes | |
| | **BSMI** | Yes | |
| | **CE Marking Compliance** | Yes | |
| | **BNCI or BELUS** | Yes | |
| | **CIT** | Yes | |
| | **GOST** | Yes | |
| | **Saudi Arabian Compliance (ICCP)** | Yes | |
| | **SABS** | Yes | |
| | **UKRSERTCOMPUTER** | Yes | |

For accessibility information on HP products, please visit: http://www.hp.com/accessibility.

## DISPLAYS

| | | |
|---|---|---|
| **15.6" diagonal LED-backlit HD anti-glare SVA flat (1366 x 768)** | **Outline Dimensions** (W x H x D) | 14.17 x 8.83 x 0.15 in (36.0 x 22.43 x 0.38 cm) |
| | **Active Area** | 13.55 x 7.62 in (34.42 x 19.35 cm) |
| | **Weight** | < 1.1 lb (500 g) (max) |

| | | |
|---|---|---|
| **Diagonal Size** | 15.6 in (39.62 cm) | |
| **Surface Treatment** | Anti-glare | |
| **Contrast Ratio** | 300:1 (min) | |
| **Refresh Rate** | 60 Hz | |
| **Brightness** | 200 nit (typical) | |
| **Pixel Resolution** | **Format** | 1366 x 768 (HD) |
| | **Configuration** | RGB Stripe |
| **Interface** | eDP 1.2 (1 lane) | |
| **LCD Mode** | TN | |
| **PPI** | 101 ppi | |
| **Viewing Angle** | SVA 30/30/20/10 (min) (Left/Right/Down/Up) | |

| | | |
|---|---|---|
| **15.6" diagonal LED-backlit FHD anti-glare SVA flat (1920 x 1080)** | **Outline Dimensions** (W x H x D) | 14.17 x 8.83 x 0.15 in (36.0 x 22.43 x 0.32 cm) |
| | **Active Area** | 13.55 x 7.62 in (34.42 x 19.36 cm) |
| | **Weight** | < 0.84 lb (380 g) (max) |
| | **Diagonal Size** | 15.6 in (39.62 cm) |
| | **Surface Treatment** | Anti-glare |
| | **Contrast Ratio** | 300:1 (typical) |
| | **Refresh Rate** | 60 Hz |
| | **Brightness** | 300 nit (typical) |
| | **Pixel Resolution** **Format** | 1920 x 1080 (FHD) |
| | **Configuration** | RGB Stripe |
| | **Interface** | eDP 1.2 (2 lane) |
| | **LCD Mode** | TN |
| | **PPI** | 142 ppi |
| | **Viewing Angle** | SVA 30/30/20/10 (min) (Left/Right/Down/Up) |

| | | |
|---|---|---|
| **15.6" diagonal LED-backlit FHD anti-glare SVA flat (1920 x 1080) + touch** | **Outline Dimensions** (W x H x D) | 14.17 x 8.83 x 0.15 in (36.0 x 22.43 x 0.32 cm) |
| | **Active Area** | 13.55 x 7.62 in (34.42 x 19.36 cm) |
| | **Weight** | < 0.84 lb (380 g) (max) |
| | **Diagonal Size** | 15.6 in (39.62 cm) |
| | **Touch enabled** | Yes |
| | **TSP Type** | Capacitive |
| | **Touch point supported** | Min 5-point & Max 10-point for Win8 |
| | **Surface Treatment** | Anti-glare |
| | **Contrast Ratio** | 400:1 (typical) |
| | **Refresh Rate** | 60 Hz |
| | **Brightness** | 300 nit (typical) |

| | | |
|---|---|---|
| **Pixel Resolution** | **Format** | 1920 x 1080 (FHD) |
| | **Configuration** | RGB Stripe |
| **Interface** | eDP 1.2 (2 lane) | |
| **LCD Mode** | TN | |
| **PPI** | 142 ppi | |
| **Viewing Angle** | SVA 45/45/25/35 (Left/Right/Down/Up) | |

## STORAGE AND DRIVES

| | | |
|---|---|---|
| **320 GB\* 7200 rpm SATA Hard Drive** | **Drive Weight** | 0.21 lbs (95 g) | |
| | **Capacity** | 320 GB | |
| | **Height** | 0.28 in (7 mm) | |
| | **Width** | 2.75 in (69.85 mm) | |
| | **Interface** | ATA-8, SATA 3.0 | |
| | **Transfer Rate** | **Synchronous** (maximum) | 600 MB/s (Drive Capability) |
| | **Seek Time** (typical reads, including settling) | **Single Track** | 1.5 ms-2ms |
| | | **Average** | 12 ms-13ms |
| | | **Maximum** | 18ms-22 ms |
| | **Cache** | Up to 32 MB | |
| | **Rotational Speed** | 7200 rpm | |
| | **Logical Blocks** | 625,142,448 | |
| | **Operating Temperature** | 32° to 140° F (0° to 60° C) [case temp] | |
| | **Features** | ATA Security; S.M.A.R.T. IV, NCQ, Ultra DMA | |

| | | |
|---|---|---|
| **500 GB\* 7200 rpm SATA Hard Drive** | **Drive Weight** | 0.20lbs(92g- 0.21 lbs (95g) | |
| | **Capacity** | 500 GB | |
| | **Height** | 0.28 in (7 mm) | |
| | **Width** | 2.75 in (69.85 mm) | |
| | **Interface** | ATA-8, SATA 3.0 | |
| | **Transfer Rate** | **Synchronous** (maximum) | 600 MB/s (Drive Capability) |
| | **Seek Time** (typical reads, including settling) | **Single Track** | 1.5 ms-2ms |
| | | **Average** | 12 ms-13ms |
| | | **Maximum** | 18ms-22 ms |
| | **Rotational Speed** | 7200 rpm | |
| | **Logical Blocks** | 976,773,168 | |
| | **Operating Temperature** | 32° to 140° F (0° to 60° C) [case temp] | |
| | **Features** | ATA Security; S.M.A.R.T.IV, NCQ, Ultra DMA | |

**500 GB\* 5400 rpm SMART SATA II FIPS Self Encrypting Drive**

| | | |
|---|---|---|
| **Drive Weight** | 0.21 lbs (95g) | |
| **Capacity** | 500 GB | |
| **Height** | 0.28 in (7 mm) | |
| **Width** | 2.75 in (69.85 mm) | |
| **Interface** | ATA-8, SATA 3.0 | |
| **Transfer Rate** | **Synchronous** (maximum) | 600 MB/s (Drive Capability) |
| **Seek Time** (typical reads, including settling) | **Single Track** | 1.5 ms |
| | **Average** | 12 ms |
| | **Maximum** | 22 ms |
| **Cache** | 32 MB | |
| **Rotational Speed** | 5400 rpm | |
| **Logical Blocks** | 976,773,168 | |
| **Operating Temperature** | 32° to 140° F (0° to 60° C) [case temp] | |
| **Features** | ATA Security; TCG Opal 2.x, FIPS | |

**1 TB\* 7200 rpm SATA Hard Drive**

| | | |
|---|---|---|
| **Drive Weight** | 0.25 lb (115 g) | |
| **Capacity** | 1 TB | |
| **Height** | 0.37 in (9.5 mm) | |
| **Width** | 2.75 in (69.85 mm) | |
| **Interface** | ATA-8, SATA 3.0 | |
| **Transfer Rate** | **Synchronous** (maximum) | 600 MB/s (Drive Capability) |
| **Seek Time** (typical reads, including settling) | **Single Track** | 2 ms |
| | **Average** | 13 ms |
| | **Maximum** | 15 ms |
| **Rotational Speed** | 7200 rpm | |
| **Logical Blocks** | 1,953,525,168 | |
| **Operating Temperature** | 32° to 140° F (0° to 60° C) [case temp] | |
| **Features** | ATA Security; S.M.A.R.T. IV, NCQ, Ultra DMA | |

**SATA 3 Gb/s 32 GB\*, M.2 2242 Solid State Drive**

| | | |
|---|---|---|
| **Drive Weight** | 10 Grams | |
| **Capacity** | 32 GB | |
| **Height** | 0.09 in (3.7 mm) | |
| **Width** | 0.87 in (22 mm) | |
| **Interface** | ATA-8, SATA 3.0 | |
| **Performance** | **Maximum Sequential Read** | **Maximum Sequential Write** |
| | Up to 380 MB/s | Up to 110 MB/s |
| **Logical Blocks** | 62,533,296 | |

|  | Operating Temperature | 32° to 158°F (0° to 70°C) [ambient temp] | |
| --- | --- | --- | --- |
|  | Features | ATA Security; DIPM; TRIM; DEVSLP | |

| SATA 3 Gb/s 120 GB*, M.2 2242 Solid State Drive | Drive Weight | 10 Grams | |
| --- | --- | --- | --- |
|  | Capacity | 120 GB | |
|  | Height | 0.09 in (3.7 mm) | |
|  | Width | 0.87 in (22 mm) | |
|  | Interface | ATA-8, SATA 3.0 | |
|  | Performance | **Maximum Sequential Read** | **Maximum Sequential Write** |
|  |  | Up to 540 MB/s | Up to 480 MB/s |
|  | Logical Blocks | 234,441,648 | |
|  | Operating Temperature | 32° to 158°F (0° to 70°C) [ambient temp] | |
|  | Features | ATA Security; DIPM; TRIM; DEVSLP | |

| SATA 3 Gb/s 128 GB*, 2.5-inch MLC Solid State Drive | Drive Weight | 78 Grams | |
| --- | --- | --- | --- |
|  | Capacity | 128 GB | |
|  | Height | 0.28 in (7 mm) | |
|  | Width | 2.75 in (69.85 mm) | |
|  | Interface | ATA-8, SATA 3.0 | |
|  | Performance | **Maximum Sequential Read** | **Maximum Sequential Write** |
|  |  | Up to 550 MB/s | Up to 350 MB/s |
|  | Logical Blocks | 250,069,680 | |
|  | Operating Temperature | 32° to 158°F (0° to 70°C) [ambient temp] | |
|  | Features | ATA Security; DIPM; TRIM; DEVSLP | |

| SATA 3 Gb/s 128 GB*, 2.5-inch TLC Solid State Drive | Drive Weight | 78 Grams | |
| --- | --- | --- | --- |
|  | Capacity | 128 GB | |
|  | Height | 0.28 in (7 mm) | |
|  | Width | 2.75 in (69.85 mm) | |
|  | Interface | ATA-8, SATA 3.0 | |
|  | Performance | **Maximum Sequential Read** | **Maximum Sequential Write** |
|  |  | Up to 520 MB/s | Up to 140 MB/s |
|  | Logical Blocks | 250,069,680 | |
|  | Operating Temperature | 32° to 158°F (0° to 70°C) [ambient temp] | |
|  | Features | ATA Security; DIPM; TRIM; DEVSLP | |

| SATA 3 Gb/s 180 GB*, 2.5-inch SATA Solid State Drive | Drive Weight | 78 Grams | |
| --- | --- | --- | --- |
|  | Capacity | 180 GB | |
|  | Height | 0.28 in (7 mm) | |
|  | Width | 2.75 in (69.85 mm) | |
|  | Interface | ATA-8, SATA 3.0 | |

# QuickSpecs

| | Performance | Maximum Sequential Read | Maximum Sequential Write |
|---|---|---|---|
| | | Up to 540 MB/s | Up to 490 MB/s |
| | Logical Blocks | 351,651,888 | |
| | Operating Temperature | 32° to 158°F (0° to 70°C) [ambient temp] | |
| | Features | ATA Security; DIPM; TRIM; DEVSLP | |

| **SATA 3 Gb/s 180 GB\*, 2.5-inch SATA SED Solid State Drive** | Drive Weight | Up to 78 Grams | |
|---|---|---|---|
| | Capacity | 180 GB | |
| | Height | 0.28 in (7 mm) | |
| | Width | 2.75 in (69.85 mm) | |
| | Interface | ATA-8, SATA 3.0 | |
| | Performance | Maximum Sequential Read | Maximum Sequential Write |
| | | Up to 540 MB/s | Up to 490 MB/s |
| | Logical Blocks | 351,651,888 | |
| | Operating Temperature | 32° to 158°F (0° to 70°C) [ambient temp] | |
| | Features | ATA Security; DIPM; TRIM; DEVSLP; TCG Opal 1x | |

| **SATA 3 Gb/s 240 GB\*, 2.5-inch Solid State Drive** | Drive Weight | 78 Grams | |
|---|---|---|---|
| | Capacity | 240 GB | |
| | Height | 0.28 in (7 mm) | |
| | Width | 2.75 in (69.85 mm) | |
| | Interface | ATA-8, SATA 3.0 | |
| | Performance | Maximum Sequential Read | Maximum Sequential Write |
| | | Up to 540 MB/s | Up to 490 MB/s |
| | Logical Blocks | 468,862,128 | |
| | Operating Temperature | 32° to 158°F (0° to 70°C) [ambient temp] | |
| | Features | ATA Security; DIPM; TRIM; DEVSLP | |

| **SATA 3 Gb/s 256 GB\*, 2.5-inch Solid State Drive** | Drive Weight | 78 Grams | |
|---|---|---|---|
| | Capacity | 256 GB | |
| | Height | 0.28 in (7 mm) | |
| | Width | 2.75 in (69.85 mm) | |
| | Interface | ATA8, SATA 3.0 | |

|  | Performance | Maximum Sequential Read | Maximum Sequential Write |
|---|---|---|---|
|  |  | Up to 520 MB/s | Up to 280 MB/s |
|  | Logical Blocks | 500,118,192 |  |
|  | Operating Temperature | 32° to 158°F (0° to 70°C) [ambient temp] |  |
|  | Features | ATA Security; TCG Opal 2.x; DIPM; TRIM; DEVSLP |  |

| **SATA 3 Gb/s 256 GB*, 2.5-inch Self Encrypting Solid State Drive** | Drive Weight | 78 Grams |  |
|---|---|---|---|
|  | Capacity | 256 GB |  |
|  | Height | 0.28 in (7 mm) |  |
|  | Width | 2.75 in (69.85 mm) |  |
|  | Interface | ATA8, SATA 3.0 |  |
|  | Performance | Maximum Sequential Read | Maximum Sequential Write |
|  |  | Up to 550 MB/s | Up to 500 MB/s |
|  | Logical Blocks | 500,118,192 |  |
|  | Operating Temperature | 32° to 158°F (0° to 70°C) [ambient temp] |  |
|  | Features | ATA Security; TCG Opal 2.x; DIPM; TRIM; DEVSLP |  |

| **SATA 3 Gb/s 256 GB*, 2.5-inch M2 PCIe Solid State Drive** | Drive Weight | 10 Grams |  |
|---|---|---|---|
|  | Capacity | 256 GB |  |
|  | Height | 0.24 in (60 mm) |  |
|  | Width | 0.87 in (22 mm) |  |
|  | Interface | ATA-8, PCIe 2.0 |  |
|  | Performance | Maximum Sequential Read | Maximum Sequential Write |
|  |  | Up to 730 MB/s | 620 MB/s |
|  | Logical Blocks | 500,118,192 |  |
|  | Operating Temperature | 32° to 158°F (0° to 70°C) [ambient temp] |  |
|  | Features | ATA Security; DIPM; TRIM; DEVSLP |  |

| **SATA 3 Gb/s 512 GB*, 2.5-inch Solid State Drive** | Drive Weight | 78 Grams |
|---|---|---|
|  | Capacity | 512 GB |
|  | Height | 0.28 in (7 mm) |
|  | Width | 2.75 in (69.85 mm) |

| | | |
|---|---|---|
| **Interface** | ATA-8, SATA 3.0 | |
| **Performance** | **Maximum Sequential Read** | **Maximum Sequential Write** |
| | Up to 550 MB/s | Up to 550 MB/s |
| **Logical Blocks** | 1,000,215,216 | |
| **Operating Temperature** | 32° to 158°F (0° to 70°C) [ambient temp] | |
| **Features** | ATA Security; DIPM; TRIM; DEVSLP | |

## NETWORKING/COMMUNICATIONS

**Broadband Wireless (WWAN)\***

**HP lt4211 LTE/EV-DO/ HSPA+ Gobi 4G Module**

| | |
|---|---|
| **Technology/Operating bands** | LTE: 1900 (Band 2), 1700/2100 (Band 4), 850 (Band 5), 700 (Band 13 upper SMH), 700 (Band 17 lower SMH), 1900 MHz (Band 25, extended PCS) MHz<br>HSPA+: 2100 (Band 1), 1900 (Band 2), 1700/2100 (Band 4), 850 (Band 5), 900 (Band 8) MHz<br>E-GPRS: 1900 (Band 2), 1800 (Band 3), 850 (Band 5), 900 (Band 8) MHz<br>EV-DO: 800 (BC0), 1900 (BC1) MHz |
| **Wireless protocol standards** | 3GPP Release 8 LTE Specification<br>WCDMA R99, 3GPP Release 5, 6 and 7 UMTS Specification<br>E-GPRS: Class B, Multi-slot class 33, coding schemes CS1 - CS4 and MSC1 - MSC9<br>EVDO Release 0 and Release A |
| **GPS** | Standalone, A-GPS |
| **GPS bands** | 1575.42 MHz ± 1.023 MHz, GLONASS 1596-1607MHz |
| **Maximum data rates** | LTE: 100 Mbps (Download), 50 Mbps (Upload)<br>DC-HSPA+: 42 Mbps (Download), 5.76 Mbps (Upload)<br>HSPA+: 21.6 Mbps (Download), 5.76 Mbps (Upload)<br>EDGE: 236.8 kbps (Download), 236.8 kbps (Upload)<br>GPRS: 85.6 kbps(Download), 85.6 kbps (Upload)<br>CDMA 1x: DL 153.6 kbps/UL 153.6 kbps<br>EVDO Rev.A: DL 3.1 Mbps/UL 1.8 Mbps |
| **Maximum output power** | LTE: 23 dBm<br>HSPA+: 23.5 dBm<br>E-GPRS 1900/1800: 26.5 dBM<br>E-GPRS 900/850: 27.5 dBM<br>GPRS 1900/1800: 29.5 dBm<br>GPRS 900/850: 32.5 dBm<br>CDMA/EVDO: 24dBm |
| **Maximum power consumption** | LTE: 1,200 mA (peak); 900 mA (average)<br>HSPA+: 1,100 mA (peak); 800 mA (average)<br>E-GPRS: 2,800 mA (peak); 700 mA (average)<br>EVDO: 1000mA (peak); 720mA (average) |

| | | |
|---|---|---|
| **Form Factor** | | M.2, 3042-S3 Key B |
| **Weight** | | 6 g |
| **Dimensions**<br>(Length x Width x<br>Thickness) | | 1.65 x 1.18 x 0.09 in (42 x 30 x 2.3 mm) |
| | | |
| **HP lt4112 LTE/HSPA+<br>Gobi 4G Module\*\*** | **Technology/Operating bands** | LTE FDD all bands with diversity: 2100 MHz (Band I), 1900 MHz (Band II), 1800 MHz (Band III), 850 MHz (Band V), 2600 MHz (Band VII), 900 MHz (Band VIII), 800 MHz (Band XX, DD800)<br>WCDMA/HSDPA/HSUPA/HSPA+ all bands with diversity: 2100 MHz (Band I), 1900 MHz (Band II), 800 MHz (Band V), 900 MHz (Band VIII)<br>GSM/GPRS/EDGE: 1900 MHz (Band II), 1800 MHz (Band III), 850 MHz (Band V), 900 MHz (Band VIII) |
| | **Wireless protocol standards** | 3GPP Release 8 LTE Specification<br>WCDMA R99, 3GPP Release 5, 6 and 7 UMTS Specification |
| | **Wireless parametric standards** | Complies with 3GPP specifications Release 8 for LTE |
| | **Maximum data rates** | LTE (Category 3): 100 Mbps (Download), 50Mbps (Upload)<br>DC-HSPA+: 42 Mbps (Download), 5.76 Mbps (Upload)<br>HSPA+: 21.6 Mbps (Download), 5.76 Mbps (Upload)<br>EDGE: 236.8 kbps (Download), 236.8 kbps (Upload)<br>GPRS: 85.6 kbps(Download), 85.6 kbps (Upload) |
| | **GPS** | Standalone |
| | **GPS bands** | 1575.42 MHz (± 1.023 MHz), GLONASS 1596-1607MHz |
| | **Maximum output power** | LTE: +23 dBm (+/- 2 dBm)<br>WCDMA: +23.5 dBm (+/- 1 dBm)<br>GPRS Band II, III: +29.5 dBm (+/- 1 dBm)<br>GPRS Band V, VIII: +32.5 dBm (+/- 1 dBm)<br>EGPRS Band II, III: +26.5 dBM (+/-1.5 dBm)<br>EGPRS Band V, VIII: +27.5 dBM (+/-1.5 dBm) |
| | **Maximum power consumption** | LTE: 1,200 mA (peak); <900 mA (average)<br>WCDMA: 1,100 mA (peak); <800 mA (average)<br>EGPRS: 2,800 mA (peak); <700 mA (average) |
| | **Power consumption, sleep mode** | 3 mA |
| | **Power management** | USB selective suspend, Integrated notebook wireless button |
| | **Antenna type** | Dual high efficiency multi-band antennae with spatial diversity |
| | **Form Factor** | M.2, USB 2.0 interface |
| | **Weight** | 6 g |
| | **Dimensions**<br>(Length x Width x<br>Thickness) | 42 mm × 30 mm × 2.3 mm |
| | **Voltage, Operating** | 3.135 V to 4.4 V (3.3 V +1.1V/-0.165V) |
| | **Temperature, operating**<br>(from TIA/EIA/IS-98-D) | 14° to 131° F (−10° to 55° C) |

| | |
|---|---|
| **Temperature, non-operating, 96 hours** (from MIL-STD 202 Method 108) | −40° to 185° F (−40° to 85° C) |
| **Humidity, non-operating** | 95% relative humidity for 48 hours @ 185° F (85° C) (non-condensing) |
| **LED activity** | LED Off - Radio Off; Solid LED On - Radio On |

\* 4G LTE not available on all products, in all regions and only available on products featuring Intel processors. WWAN use requires separately purchased service contract. Check with service provider for coverage and availability in your area. Connection speeds will vary due to location, environment, network conditions, and other factors.

**HP hs3110 HSPA+ Mobile Broadband Module**

| | |
|---|---|
| **Technology/Operating bands** | HSPA+: 2100 (Band 1), 1900 (Band 2), 850 (Band 5), 700 (Band 17) MHz<br>E-GPRS: 1900 (Band 2), 1800 (Band 3), 850 (Band 5), 900 (Band 8) MHz |
| **Wireless protocol standards** | WCDMA R99, 3GPP Release 5, 6 and 7 UMTS Specification<br>E-GPRS: Class B, Multi-slot class 33, coding schemes CS1 - CS4 and MSC1 - MSC9 |
| **GPS** | Standalone, A-GPS |
| **GPS bands** | 1575.42 MHz ± 1.023 MHz, GLONASS 1596-1607MHz |
| **Maximum data rates** | DC-HSPA+: 42 Mbps (Download), 5.76 Mbps (Upload)<br>HSPA+: 21.6 Mbps (Download), 5.76 Mbps (Upload)<br>EDGE: 236.8 kbps (Download), 236.8 kbps (Upload)<br>GPRS: 85.6 kbps(Download), 85.6 kbps (Upload) |
| **Maximum output power** | HSPA+: 23.5 dBm<br>E-GPRS 1900/1800: 26.5 dBM<br>E-GPRS 900/850: 27.5 dBM<br>GPRS 1900/1800: 29.5 dBm<br>GPRS 900/850: 32.5 dBm |
| **Maximum power consumption** | HSPA+: 1,100 mA (peak); 800 mA (average)<br>E-GPRS: 2,800 mA (peak); 700 mA (average) |
| **Form Factor** | M.2, 3042-S3 Key B |
| **Weight** | 6g |
| **Dimensions** (Length x Width x Thickness) | 1.65 x 1.18 x 0.09 in (42 x 30 x 2.3 mm) |

**Wireless LAN (WLAN)**

**Intel® 802.11 a/b/g/n ac (2X2) + Bluetooth®**

| | |
|---|---|
| **Wireless LAN Standards** | IEEE 802.11a<br>IEEE 802.11b<br>IEEE 802.11g<br>IEEE 802.11n<br>IEEE 802.11ac |

| | |
|---|---|
| **Interoperability** | Wi-Fi certified |
| **Frequency Band** | 802.11b/g/n |

- 2.402 – 2.482 GHz
  Note:
  The FCC has declared as of January 1, 2015 products that utilize passive scanning on channel 12/13 and are capable of transmitting must fully comply with requirements of 15.247 or otherwise disable those channels.

802.11a

- 4.9 – 4.95 GHz (Japan)
- 5.15 – 5.25 GHz
- 5.25 – 5.35 GHz
- 5.47 – 5.725 GHz
- 5.825 – 5.850 GHz
  Note:
  Indonesia only supports 5.725 - 5.825 GHz (CH149 - CH161)

| | |
|---|---|
| **Data Rates** | 802.11b: 1, 2, 5.5, 11 Mbps |
| | 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps |
| | 802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps |
| | 802.11n: MCS 0 ~ MCS 15, (20MHz, and 40MHz) |
| | 802.11ac : MCS0 ~ MCS9, (1SS, and 2SS) (20MHz, 40MHz, and 80MHz) |
| **Modulation** | Direct Sequence Spread Spectrum |
| | BPSK, QPSK, CCK, 16-QAM, 64-QAM, 256-QAM |
| **Security1** | |

- IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only
- AES-CCMP: 128 bit in hardware
- 802.1x authentication
- WPA, WPA2:  802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES.
- WPA2 certification
- IEEE 802.11i
- Cisco Certified Extensions, all versions through CCX4 and CCX Lite
- WAPI

| | |
|---|---|
| **Network Architecture** | Ad-hoc (Peer to Peer) |
| **Models** | Infrastructure (Access Point Required) |
| **Roaming** | IEEE 802.11 compliant roaming between access points |
| **Output Power[2]** | 802.11b : +16dBm minimum |
| | 802.11g : +14dBm minimum |
| | 802.11a : +14dBm minimum |
| | 802.11n HT20(2.4GHz) : +13dBm minimum |
| | 802.11n HT40(2.4GHz) : +13dBm minimum |
| | 802.11n HT20(5GHz) : +12dBm minimum |
| | 802.11n HT40(5GHz) : +12dBm minimum |
| | 802.11ac 80MHz(5GHz) : +11dBm minimum |
| **Power Consumption** | Transmit:     2.0 W (max) |
| | Receive:     1.6 W (max) |
| | Idle mode (PSP):  180 mW (WLAN Associated) |
| | Idle mode:     60 mW  (WLAN unassociated) |
| | Radio disabled:  30 mW |
| **Power Management** | ACPI and PCI Express compliant power management |
| | 802.11 compliant power saving mode |

| | |
|---|---|
| **Receiver Sensitivity[3]** | 802.11b, 1Mbps : -94dBm maximum |
| | 802.11b, 11Mbps : -86dBm maximum |
| | 802.11g, 6Mbps : -88dBm maximum |
| | 802.11g, 54Mbps : -74dBm maximum |
| | 802.11a, 6Mbps : -86dBm maximum |
| | 802.11a, 54Mbps : -72dBm maximum |
| | 802.11n, MCS07 : -69dBm maximum |
| | 802.11n, MCS15 : -66dBm maximum |
| | 802.11ac, 1SS, MCS-0 : -86dBm maximum |
| | 802.11ac, 1SS, MCS-9 : -61dBm maximum |
| | 802.11ac, 2SS, MCS-0 : -83dBm maximum |
| | 802.11ac, 2SS, MCS-9 : -58dBm maximum |
| **Antenna type** | High efficiency antenna with spatial diversity, mounted in the display enclosure |
| | Two embedded dual band 2.4/5 GHz antennas are provided to the card to support WLAN MIMO communications and Bluetooth communications |
| **Form Factor** | PCI-Express M.2 MiniCard |
| **Dimensions** | Type 2230 : 2.3 x 22.0 x 30.0 mm |
| | Or |
| | Type 1630 : 2.3 x 16.0 x 30.0 mm |
| **Weight** | Type 2230 : 2.8g |
| | Or |
| | Type 1630 : 2g |
| **Operating Voltage** | 3.3v +/- 9% |

| | | |
|---|---|---|
| **Temperature** | Operating | 14° to 158° F (−10° to 70° C) |
| | Non-operating | −40° to 176° F (−40° to 80° C) |
| **Humidity** | Operating | 10% to 90% (non-condensing) |
| | Non-operating | 5% to 95% (non-condensing) |
| **Altitude** | Operating | 0 to 10,000 ft (3,048 m) |
| | Non-operating | 0 to 50,000 ft (15,240 m) |
| **LED Activity** | LED Amber  – Radio OFF; LED White – Radio ON | |

1. Check latest software/driver release for updates on supported security features.
2. Maximum output power may vary by country according to local regulations.
3. Receiver sensitivity is measured at a packet error rate of 8% for 802.11b (CKK modulation) and a packet error rate of 10% for 802.11a/g (OFDM modulation).

**HP Integrated Module with Bluetooth 4.0+EDR Wireless Technology**

| | |
|---|---|
| **Bluetooth Specification** | 4.0+EDR Compliant |
| **Frequency Band** | 2402 to 2480 MHz |
| **Number of Available Channels** | 79 (1 MHz) available channels |
| **Data Rates and Throughput** | 3 Mbps data rate; throughput up to 2.17 Mbps |
| | Synchronous Connection Oriented links up to 3, 64 kbps, voice channels |
| | Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric or 1306.9 kbps symmetric |
| **Transmit Power** | The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of +4 dBm for BR and EDR. |

**Receiver Sensitivity**

| Modulation | 0.01% BER | 0.001% BER |
|---|---|---|
| GFSK | -80 dBm | -70 dBm |
| π/4-DQPSK | -80 dBm | -70 dBm |
| 8DPSK | -80 dBm | -70 dBm |

| | |
|---|---|
| **Power Consumption** | Peak (Tx) 330 mW |
| | Peak (Rx) 230 mW |
| | Selective Suspend 17 mW |
| **Range** | Up to 33 ft (10 m) |
| **Electrical Interface** | USB 2.0 compliant |
| **Bluetooth Software Supported Link Topology** | Microsoft Windows Bluetooth Software |
| **Electrical Interface** | Point to Point, Multipoint Pico Nets up to 7 slaves |
| **Bluetooth Software Supported Security** | Full support of Bluetooth Security Provisions |
| **Power Management** | Microsoft Windows ACPI, and USB Bus Support |
| **Power Management Certifications** | Self-configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff |
| **Security** | All necessary regulatory approvals for supported countries, including: |
| **Certifications Bluetooth Profiles Supported** | FCC (47 CFR) Part 15C, Section 15.247 & 15.249 |
| **Power Management Certifications** | ETS 300 328, ETS 300 826 |
| | Low Voltage Directive IEC950 |
| | UL, CSA, and CE Mark |
| | Serial Port Profile (SPP)[1] |
| | Service Discovery Application Profile (SDAP) |
| | Dial-Up Networking (DUN)[1,2] |
| | Generic Object Exchange Profile (GOEP)[1,2] |
| | Object Push Profile (OPP)[1,2] |
| | File Transfer Profile (FTP) |
| **Certifications** | Synchronization Profile (SYNC) |
| **Bluetooth Profiles Supported** | Hard Copy Cable Replacement (HCRP)[1,2] |
| | Personal Area Networking Profile (PAN)[1,2] |
| | Human Interface Device Profile (HID)[1,2] |
| | FAX Profile (FAX) |
| | Basic Imaging Profile (BIP)[2] |
| | Headset Profile (HSP) |
| | Hands Free Profile (HFP) |
| | Advanced Audio Distribution Profile (A2DP) |

**Intel® 802.11 a/b/g/n (2X2) +Bluetooth®**

| | |
|---|---|
| **Wireless LAN** | IEEE 802.11a |
| **Standards** | IEEE 802.11b |
| | IEEE 802.11g |
| | IEEE 802.11n |
| **Interoperability** | Wi-Fi certified |
| **Frequency Band** | 802.11b/g/n |
| | • 2.402 – 2.482 GHz |
| | Note: |
| | The FCC has declared as of January 1, 2015 products that utilize passive scanning on channel 12/13 and are capable of transmitting must fully comply with requirements of 15.247 or otherwise disable those channels. |

802.11a

- 4.9 – 4.95 GHz (Japan)
- 5.15 – 5.25 GHz
- 5.25 – 5.35 GHz
- 5.47 – 5.725 GHz
- 5.825 – 5.850 GHz

Note:
  Indonesia only supports 5.725 - 5.825 GHz (CH149 - CH161)

| | |
|---|---|
| **Antenna Structure** | 2 transmit; 2 receive (2x2) |
| **Data Rates** | 802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps<br>802.11b: 1, 2, 5.5, 11 Mbps<br>802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps<br>802.11n: MCS 0 ~ MCS 15, (20MHz, and 40MHz) |
| **Modulation** | Direct Sequence Spread Spectrum<br>CCK, BPSK, QPSK, 16-QAM, 64-QAM |

**Security**[1]

- IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only
- AES-CCMP: 128 bit in hardware
- 802.1x authentication
- WPA, WPA2: 802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES.
- WPA2 certification
- IEEE 802.11i
- Cisco Certified Extensions, all versions through CCX4 and CCX Lite
- WAPI

| | |
|---|---|
| **Sub-channels** | Multinational support with frequency bands and channels compliant to local regulations. |
| **Network Architecture** | Ad-hoc (Peer to Peer) |
| **Models** | Infrastructure (Access Point Required) |
| **Roaming** | IEEE 802.11 compliant roaming between band Access Points |

**Output Power**[2]

- 802.11b : +16dBm minimum
- 802.11g : +14dBm minimum
- 802.11a : +14dBm minimum
- 802.11n HT20(2.4GHz) : +13dBm minimum
- 802.11n HT40(2.4GHz) : +13dBm minimum
- 802.11n HT20(5GHz) : +12dBm minimum
- 802.11n HT40(5GHz) : +12dBm minimum

| | |
|---|---|
| **Power Consumption** | Transmit:     2.0 W (max)<br>Receive:     1.6 W (max)<br>Idle mode (PSP): 180 mW (WLAN Associated)<br>Idle mode:     60 mW  (WLAN unassociated)<br>Radio disabled:  30 mW |
| **Power Management** | ACPI and PCI Express compliant power management<br>802.11 compliant power saving mode |
| **Receiver Sensitivity**[4] | 802.11b, 1Mbps : -94dBm maximum<br>802.11b, 11Mbps : -86dBm maximum<br>802.11g, 6Mbps : -88dBm maximum<br>802.11g, 54Mbps : -74dBm maximum |

|  |  |  |
|---|---|---|
|  | 802.11a, 6Mbps : -86dBm maximum | |
|  | 802.11a, 54Mbps : -72dBm maximum | |
|  | 802.11n, MCS07 : -69dBm maximum | |
|  | 802.11n, MCS15 : -66dBm maximum | |
| **Antenna type** | High efficiency antenna with spatial diversity, mounted in the display enclosure | |
|  | Two embedded dual band 2.4/5 GHz antennas are provided to the card to support WLAN MIMO and Bluetooth communications | |
| **Form Factor** | PCI-Express M.2 MiniCard | |
| **Dimensions** | Type 2230 : 2.3 x 22.0 x 30.0 mm | |
|  | Or | |
|  | Type 1630 : 2.3 x 16.0 x 30.0 mm | |
| **Weight** | Type 2230 : 2.8g | |
|  | Or | |
|  | Type 1630 : 2g | |
| **Operating Voltage** | 3.3v +/- 9% | |
| **Temperature** | Operating | 14° to 158° F (-10° to 70° C) |
|  | Non-operating | -40° to 176° F (-40° to 80° C) |
| **Humidity** | Operating | 10% to 90% (non- |
|  | Non-operating | condensing) |
|  |  | 5% to 95% (non-condensing) |
| **Altitude** | Operating | 0 to 10,000 ft (3,048 m) |
|  | Non-operating | 0 to 50,000 ft (15,240 m) |
| **LED Activity** | LED Amber - Radio OFF; LED White - Radio ON | |

1. Check latest software/driver release for updates on supported security features.
2. Maximum output power may vary by country according to local regulations.
3. In Power Save Polling mode and on battery power.
4. Receiver sensitivity is measured at a packet error rate of 8% for 802.11b (CCK modulation) and a packet error rate of 10% for 802.11a/g (OFDM modulation).
5. WLAN supplier's client utility is required for Cisco Compatible Extensions support with Microsoft Windows XP. WLAN may also be compatible with certain third-party software supplicants. WLAN supplier IHV extensions required for Cisco Compatible Extensions support for Microsoft Windows Vista.


**HP Integrated Module with Bluetooth 4.0+EDR Wireless Technology**

| | |
|---|---|
| **Bluetooth Specification** | 4.0+EDR Compliant |
| **Frequency Band** | 2402 to 2480 MHz |
| **Number of Available Channels** | 79 (1 MHz) available channels |
| **Data Rates and Throughput** | 3 Mbps data rate; throughput up to 2.17 Mbps |
|  | Synchronous Connection Oriented links up to 3, 64 kbps, voice channels |
|  | Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric or 1306.9 kbps symmetric |
| **Transmit Power** | The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of +4 dBm for BR and EDR. |

**Receiver Sensitivity**

| Modulation | 0.01% BER | 0.001% BER |
|---|---|---|
| GFSK | -80 dBm | -70 dBm |
| π/4-DQPSK | -80 dBm | -70 dBm |
| 8DPSK | -80 dBm | -70 dBm |

| | |
|---|---|
| **Power Consumption** | Peak (Tx) 330 mW |
|  | Peak (Rx) 230 mW |
|  | Selective Suspend 17 mW |
| **Range** | Up to 33 ft (10 m) |

| | |
|---|---|
| **Electrical Interface** | USB 2.0 compliant |
| **Bluetooth Software Supported Link Topology** | Microsoft Windows Bluetooth Software |
| **Electrical Interface** | Point to Point, Multipoint Pico Nets up to 7 slaves |
| **Bluetooth Software Supported Security** | Full support of Bluetooth Security Provisions |
| **Power Management** | Microsoft Windows ACPI, and USB Bus Support |
| **Power Management Certifications** | Self-configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff |
| **Security** | All necessary regulatory approvals for supported countries, including: |
| **Certifications Bluetooth Profiles Supported** | FCC (47 CFR) Part 15C, Section 15.247 & 15.249 |
| **Power Management Certifications** | ETS 300 328, ETS 300 826 |
| | Low Voltage Directive IEC950 |
| | UL, CSA, and CE Mark |
| | Serial Port Profile (SPP)[1] |
| | Service Discovery Application Profile (SDAP) |
| | Dial-Up Networking (DUN)[1,2] |
| | Generic Object Exchange Profile (GOEP)[1,2] |
| | Object Push Profile (OPP)[1,2] |
| **Certifications Bluetooth Profiles Supported** | File Transfer Profile (FTP) |
| | Synchronization Profile (SYNC) |
| | Hard Copy Cable Replacement (HCRP)[1,2] |
| | Personal Area Networking Profile (PAN)[1,2] |
| | Human Interface Device Profile (HID)[1,2] |
| | FAX Profile (FAX) |
| | Basic Imaging Profile (BIP)[2] |
| | Headset Profile (HSP) |
| | Hands Free Profile (HFP) |
| | Advanced Audio Distribution Profile (A2DP) |

**Intel® 802.11 ac (2x2) WiFi + Bluetooth® 4.0 combo (Indonesia only)**

| | |
|---|---|
| **Wireless LAN Standards** | IEEE 802.11a |
| | IEEE 802.11b |
| | IEEE 802.11g |
| | IEEE 802.11n |
| | IEEE 802.11ac |
| **Interoperability** | Wi-Fi certified |
| **Frequency Band** | 802.11b/g/n |

- 2.402 – 2.482 GHz
  Note:
  The FCC has declared as of January 1, 2015 products that utilize passive scanning on channel 12/13 and are capable of transmitting must fully comply with requirements of 15.247 or otherwise disable those channels.

802.11a

- 4.9 – 4.95 GHz (Japan)

- 5.15 – 5.25 GHz
- 5.25 – 5.35 GHz
- 5.47 – 5.725 GHz
- 5.825 – 5.850 GHz
  Note:
  Indonesia only supports 5.725 - 5.825 GHz (CH149 - CH161)

| | |
|---|---|
| **Data Rates** | 802.11b: 1, 2, 5.5, 11 Mbps |
| | 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps |
| | 802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps |
| | 802.11n: MCS 0 ~ MCS 15, (20MHz, and 40MHz) |
| | 802.11ac : MCS0 ~ MCS9, (1SS, and 2SS) (20MHz, 40MHz, and 80MHz) |
| **Modulation** | Direct Sequence Spread Spectrum |
| | BPSK, QPSK, CCK, 16-QAM, 64-QAM, 256-QAM |

**Security1**

- IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only
- AES-CCMP: 128 bit in hardware
- 802.1x authentication
- WPA, WPA2:  802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES.
- WPA2 certification
- IEEE 802.11i
- Cisco Certified Extensions, all versions through CCX4 and CCX Lite
- WAPI

| | |
|---|---|
| **Network Architecture** | Ad–hoc (Peer to Peer) |
| **Models** | Infrastructure (Access Point Required) |
| **Roaming** | IEEE 802.11 compliant roaming between access points |
| **Output Power[2]** | 802.11b : +16dBm minimum |
| | 802.11g : +14dBm minimum |
| | 802.11a : +14dBm minimum |
| | 802.11n HT20(2.4GHz) : +13dBm minimum |
| | 802.11n HT40(2.4GHz) : +13dBm minimum |
| | 802.11n HT20(5GHz) : +12dBm minimum |
| | 802.11n HT40(5GHz) : +12dBm minimum |
| | 802.11ac 80MHz(5GHz) : +11dBm minimum |
| **Power Consumption** | Transmit:      2.0 W (max) |
| | Receive:      1.6 W (max) |
| | Idle mode (PSP):  180 mW (WLAN Associated) |
| | Idle mode:      60 mW  (WLAN unassociated) |
| | Radio disabled:  30 mW |
| **Power Management** | ACPI and PCI Express compliant power management |
| | 802.11 compliant power saving mode |
| **Receiver Sensitivity[3]** | 802.11b, 1Mbps : -94dBm maximum |
| | 802.11b, 11Mbps : -86dBm maximum |
| | 802.11g, 6Mbps : -88dBm maximum |
| | 802.11g, 54Mbps : -74dBm maximum |
| | 802.11a, 6Mbps : -86dBm maximum |
| | 802.11a, 54Mbps : -72dBm maximum |
| | 802.11n, MCS07 : -69dBm maximum |
| | 802.11n, MCS15 : -66dBm maximum |
| | 802.11ac, 1SS, MCS-0 : -86dBm maximum |
| | 802.11ac, 1SS, MCS-9 : -61dBm maximum |

|  |  |  |
|---|---|---|
|  | 802.11ac, 2SS, MCS-0 : -83dBm maximum |  |
|  | 802.11ac, 2SS, MCS-9 : -58dBm maximum |  |
| **Antenna type** | High efficiency antenna with spatial diversity, mounted in the display enclosure |  |
|  | Two embedded dual band 2.4/5 GHz antennas are provided to the card to support WLAN MIMO communications and Bluetooth communications |  |
| **Form Factor** | PCI-Express M.2 MiniCard |  |
| **Dimensions** | Type 2230 : 2.3 x 22.0 x 30.0 mm |  |
|  | Or |  |
|  | Type 1630 : 2.3 x 16.0 x 30.0 mm |  |
| **Weight** | Type 2230 : 2.8g |  |
|  | Or |  |
|  | Type 1630 : 2g |  |
| **Operating Voltage** | 3.3v +/- 9% |  |
| **Temperature** | Operating | 14° to 158° F (−10° to 70° C) |
|  | Non-operating | −40° to 176° F (−40° to 80° C) |
| **Humidity** | Operating | 10% to 90% (non-condensing) |
|  | Non-operating | 5% to 95% (non-condensing) |
| **Altitude** | Operating | 0 to 10,000 ft (3,048 m) |
|  | Non-operating | 0 to 50,000 ft (15,240 m) |
| **LED Activity** | LED Amber – Radio OFF; LED White – Radio ON |  |

4.  Check latest software/driver release for updates on supported security features.
5.  Maximum output power may vary by country according to local regulations.
6.  Receiver sensitivity is measured at a packet error rate of 8% for 802.11b (CKK modulation) and a packet error rate of 10% for 802.11a/g (OFDM modulation).

**HP Integrated Module with Bluetooth 4.0+EDR Wireless Technology**

| | |
|---|---|
| **Bluetooth Specification** | 4.0+EDR Compliant |
| **Frequency Band** | 2402 to 2480 MHz |
| **Number of Available Channels** | 79 (1 MHz) available channels |
| **Data Rates and Throughput** | 3 Mbps data rate; throughput up to 2.17 Mbps |
|  | Synchronous Connection Oriented links up to 3, 64 kbps, voice channels |
|  | Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric or 1306.9 kbps symmetric |
| **Transmit Power** | The Bluetooth component shall operate as a Class II Bluetooth device with a maximum transmit power of +4 dBm for BR and EDR. |

**Receiver Sensitivity**

| Modulation | 0.01% BER | 0.001% BER |
|---|---|---|
| GFSK | -80 dBm | -70 dBm |
| π/4-DQPSK | -80 dBm | -70 dBm |
| 8DPSK | -80 dBm | -70 dBm |

| | |
|---|---|
| **Power Consumption** | Peak (Tx) 330 mW |
|  | Peak (Rx) 230 mW |
|  | Selective Suspend 17 mW |
| **Range** | Up to 33 ft (10 m) |
| **Electrical Interface** | USB 2.0 compliant |
| **Bluetooth Software Supported Link Topology** | Microsoft Windows Bluetooth Software |
| **Electrical Interface** | Point to Point, Multipoint Pico Nets up to 7 slaves |
| **Bluetooth Software Supported Security** | Full support of Bluetooth Security Provisions |
| **Power Management** | Microsoft Windows ACPI, and USB Bus Support |

| | |
|---|---|
| **Power Management Certifications** | Self-configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff |
| **Security** | All necessary regulatory approvals for supported countries, including: |
| **Certifications** | FCC (47 CFR) Part 15C, Section 15.247 & 15.249 |
| **Bluetooth Profiles Supported** | |
| **Power Management Certifications** | ETS 300 328, ETS 300 826 |
| | Low Voltage Directive IEC950 |
| | UL, CSA, and CE Mark |
| | Serial Port Profile (SPP)[1] |
| | Service Discovery Application Profile (SDAP) |
| | Dial-Up Networking (DUN)[1,2] |
| | Generic Object Exchange Profile (GOEP)[1,2] |
| | Object Push Profile (OPP)[1,2] |
| | File Transfer Profile (FTP) |
| **Certifications** | Synchronization Profile (SYNC) |
| **Bluetooth Profiles Supported** | Hard Copy Cable Replacement (HCRP)[1,2] |
| | Personal Area Networking Profile (PAN)[1,2] |
| | Human Interface Device Profile (HID)[1,2] |
| | FAX Profile (FAX) |
| | Basic Imaging Profile (BIP)[2] |
| | Headset Profile (HSP) |
| | Hands Free Profile (HFP) |
| | Advanced Audio Distribution Profile (A2DP) |

**Intel® Dual Band Wireless-AC 3160 802.11 ac (1x1) Wi-Fi + Bluetooth®**

| | |
|---|---|
| **Wireless LAN Standards** | IEEE 802.11a |
| | IEEE 802.11b |
| | IEEE 802.11g |
| | IEEE 802.11n |
| | IEEE 802.11ac |
| **Interoperability** | Wi-Fi certified |
| **Frequency Band** | 802.11b/g/n |

- 2.402 – 2.482 GHz
  Note:
  The FCC has declared as of January 1, 2015 products that utilize passive scanning on channel 12/13 and are capable of transmitting must fully comply with requirements of 15.247 or otherwise disable those channels.

802.11a/n

- 4.9 – 4.95 GHz (Japan)
- 5.15 – 5.25 GHz
- 5.25 – 5.35 GHz
- 5.47 – 5.725 GHz
- 5.825 – 5.850 GHz
  Note:
  Indonesia only supports 5.725 - 5.825 GHz (CH149 - CH161)

| | |
|---|---|
| **Data Rates** | • 802.11b: 1, 2, 5.5, 11 Mbps<br>• 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps<br>• 802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps<br>• 802.11n: MCS 0 ~ MCS 15, (20MHz, and 40MHz)<br>• 802.11ac : MCS0 ~ MCS7, (1SS) (20MHz, 40MHz, and 80MHz) |
| **Modulation** | Direct Sequence Spread Spectrum<br>BPSK, QPSK, CCK, 16-QAM, 64-QAM, 256-QAM |
| **Security[1]** | • IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only<br>• AES-CCMP: 128 bit in hardware<br>• 802.1x authentication<br>• WPA, WPA2:  802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES.<br>• WPA2 certification<br>• IEEE 802.11i<br>• Cisco Certified Extensions, all versions through CCX4 and CCX Lite<br>• WAPI |
| **Network Architecture Models** | Ad-hoc (Peer to Peer)<br>Infrastructure (Access Point Required) |
| **Roaming** | IEEE 802.11 compliant roaming between access points |
| **Output Power[2]** | • 802.11b : +16dBm minimum<br>• 802.11g : +14dBm minimum<br>• 802.11a : +14dBm minimum<br>• 802.11n HT20(2.4GHz) : +13dBm minimum<br>• 802.11n HT40(2.4GHz) : +13dBm minimum<br>• 802.11n HT20(5GHz) : +12dBm minimum<br>• 802.11n HT40(5GHz) : +12dBm minimum<br>• 802.11ac 80MHz(5GHz) : +11dBm minimum |
| **Power Consumption** | Transmit:     2.0 W (max)<br>Receive:     1.6 W (max)<br>Idle mode (PSP):  180 mW (WLAN Associated)<br>Idle mode:     60 mW  (WLAN unassociated)<br>Radio disabled:  30 mW |
| **Power Management** | ACPI and PCI Express compliant power management<br>802.11 compliant power saving mode |
| **Receiver Sensitivity[3]** | 802.11b, 1Mbps : -94dBm maximum<br>802.11b, 11Mbps : -86dBm maximum<br>802.11g, 6Mbps : -88dBm maximum<br>802.11g, 54Mbps : -74dBm maximum<br>802.11a, 6Mbps : -86dBm maximum<br>802.11a, 54Mbps : -72dBm maximum<br>802.11n, MCS07 : -69dBm maximum<br>802.11n, MCS15 : -66dBm maximum<br>802.11ac, 1SS, MCS-0 : -86dBm maximum |

|  |  |  |
|---|---|---|
|  | 802.11ac, 1SS, MCS-9 : -61dBm maximum | |
|  | 802.11ac, 2SS, MCS-0 : -83dBm maximum | |
|  | 802.11ac, 2SS, MCS-9 : -58dBm maximum | |
| **Antenna type** | High efficiency antenna with spatial diversity, mounted in the display enclosure | |
|  | Two embedded dual band 2.4/5 GHz antennas are provided to the card to support WLAN MIMO communications and Bluetooth communications | |
| **Form Factor** | PCI-Express M.2 MiniCard | |
| **Dimensions** | Type 2230 : 2.3 x 22.0 x 30.0 mm | |
|  | Or | |
|  | Type 1630 : 2.3 x 16.0 x 30.0 mm | |
| **Weight** | Type 2230 : 2.8g | |
|  | Or | |
|  | Type 1630 : 2g | |
| **Operating Voltage** | 3.3v +/- 9% | |
| **Temperature** | Operating | 14° to 158° F (−10° to 70° C) |
|  | Non-operating | −40° to 176° F (−40° to 80° C) |
| **Humidity** | Operating | 10% to 90% (non-condensing) |
|  | Non-operating | 5% to 95% (non-condensing) |
| **Altitude** | Operating | 0 to 10,000 ft (3,048 m) |
|  | Non-operating | 0 to 50,000 ft (15,240 m) |
| **LED Activity** | LED Amber − Radio OFF; LED White − Radio ON | |

7. Check latest software/driver release for updates on supported security features.
8. Maximum output power may vary by country according to local regulations.
9. Receiver sensitivity is measured at a packet error rate of 8% for 802.11b (CKK modulation) and a packet error rate of 10% for 802.11a/g (OFDM modulation).

## AUDIO/MULTIMEDIA - DTS SOUND+

| Hardware | Implementation | Realtek ALC3228 HD |
|---|---|---|
|  | **Function Key Volume Controls** | Volume up, volume down, and mute |
|  | **Full Duplex** | Yes |
|  | **Microphone In** | Stereo |
|  | **Headphone/Line Out** | Stereo |
|  | **Integrated Microphone** | Yes, dual digital microphone array |
| Audio Output Quality | **Frequency Response** | 20 Hz – 20 kHz |
|  | **Signal to Noise Ratio** | >85 dB |
|  | **Total Harmonic Distortion** | 0.01% |
|  | **Noise Floor** | −110 dB |

| | | |
|---|---|---|
| | **Play/Record Sampling Rate**(s) | 8 kHz – 48kHz |
| | **DAC** | 16, 20 or 24-bit |
| | **ADC** | 16 or 20-bit |
| **Integrated Stereo Speakers** | **Power Rating** | 2 Watts |
| | **Impedance** | 4 Ohms |

## SECURITY

| | | | |
|---|---|---|---|
| **HP Fingerprint Reader** (optional) | **Mobile Voltage Operation** | 3.0V-3.6V | |
| | **Operating Temperature** | 14° – 167°F (-10° – 75°C) | |
| | **Current Consumption Image** | 36 mA peak | |
| | **Low Latency Wait for Finger** | 950 uA | |
| | **Capture Rate** | 6000 lines/sec | |
| | **ESD Resistance** | IEC 61000-4-2 4B (±15KV) | |
| | **Detection Matrix** | 200*1 (plus another secondary line) 508 dpi 12*3 mm sensor area | |
| **Smart Card Reader** | **Smart card standard** | PC/SC 2.0 for Windows smart card standard | |
| | **Dimensions** (L x W x H) | 0.41x 0.08 x 0.32 in (10.5 x 2 x 8.2 mm) | |
| | **Smart Card support** | ISO 7816 Class A and AB smart cards | |
| | **Smart Card Interface** | Smart Card Interface with T = 0 and T = 1 support Support I2C memory card, SLE4418, SLE4428, SLE4432, SLE4442, SLE4436, SLE5536, SLE6636, AT88SC1608, AT45D041 card and AT45DB041 card via external EEPROM | |
| | **Operating systems** | No driver is required for this device. Native support is provided by the operating system. | |
| | **Power** | **Normal Mode** | With card present, before being suspended: 40.9 mA Without card present, before being suspended: 33.16 mA After being suspended with smart card present: 380 µA After being suspended without smart card present: 380 µA |
| | | **Power Saving Mode** | With card present, before being suspended: 40.6 mA Without card present: 380 µA After being suspended with smart card present: 380 µA |
| | **Features** | • Support single slot • Support T0, T1 protocol | |

- Support I2C memory card, SLE4418, SLE4428, SLE4432, SLE4442, SLE4436,
- SLE5536, SLE6636, AT88SC1608, AT45D041 card and AT45DB041 card via external EEPROM
- Support ISO7816 Class A, B and C (5V/3V/1.8V) card
- Implemented as an USB full speed device with bulk transfer endpoint, Mass
- Storage endpoint
- Built-in PLL for USB and Smart Card clocks requirement
- Support EEPROM for USB descriptors customization (PID/VID/ iManufacturer/iProduct/Serial Number), Direct Web Page Link, and accessing memory card module.
- EEPROM programmable via USB interface
- Support software update for memory card module
- Support Direct Web Page Link via configuration in external EEPROM
- Support short APDU and extended APDU
- Compatible with Microsoft USB-CCID driver
- Support remote wake up through inserting card/removing card
- Support USB selective suspend
- Support Power Saving Mode (Using one pin to select between Normal/PWR Saving Mode)
- Support card power over current protection mechanism
- Built in resonator.
- Support USB LPM (Link Power Management) features.
- Embedded clock source.

## POWER

| HP 45W Smart AC Adapter Non-Slim (740015)& Non-Slim 2 Prong (742313) | Dimensions | 95.0 x 40.0 x 26.5mm | |
|---|---|---|---|
| | Input | 90 to 265 VAC | |
| | | Input Efficiency | 88% min at 115 VAC / 89% min at 230VAC |
| | | Input frequency range | 47 to 63 Hz |
| | | Input AC current | 1.4 A at 90 VAC and maximum load |
| | Output | Output power | 45W |
| | | DC output | 19.5V |
| | | Hold-up time | 5 msec at 115 VAC input |
| | | Output current limit | <8A, Over voltage protection- 29V max automatic shutdown |
| | Connector | 3 pin/grounded, mates with interchangeable cords | |
| | Environmental Design | Operating temperature | 32° to 95° F (0° to 35° C) |
| | | Non-operating (storage) temperature | -4° to 121° F (-20° to 85° C) |
| | | Altitude | 0 to 16,405 ft (0 to 5,000 m) |
| | | Humidity | 0% to 95% |
| | | Storage Humidity | 0% to 95% |

| | | |
|---|---|---|
| **EMI and Safety Certifications** | CE Mark - full compliance with LVD and EMC directives; Worldwide safety standards - IEC60950, EN60950, UL60950, Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55022 Class B, FCC Class B, CISPR22 Class B, CCC, NOM-1 NYCE; Reliability - failure rate of less than 0.1% annually within the first three years of operation. | |

| | | | |
|---|---|---|---|
| **HP 65W Smart AC Adapter** | **Dimensions** | 4.17 x 1.85 x 1.1 in (10.6 x 4.7 x 2.8 cm) | |
| | **Weight** | 0.62 lb (280 g) | |
| | **Input** | 100 to 240 VAC | |
| | | Input Efficiency | **87% min at 115 VAC** |
| | | Input frequency range | 47 to 63 Hz |
| | | Input AC current | 1.7 A at 90 VAC, 0.85 A at 180 VAC |
| | **Output** | Output power | 65W |
| | | DC output | 18.5V |
| | | Hold-up time | 5 msec at 115 VAC input |
| | | Output current limit | <11A, Over voltage protection- 29V max automatic shutdown |
| | **Connector** | 3 pin/grounded, mates with interchangeable cords | |
| | **Environmental Design** | Operating temperature | 32° to 104° F (0° to 40° C) |
| | | Non-operating (storage) temperature | -4° to 149° F (-20° to 65° C) |
| | | Altitude | 0 to 16,405 ft (0 to 5, 000 m) |
| | | Humidity | 20% to 80% |
| | | Storage Humidity | 10% to 90% |
| | **EMI and Safety Certifications** | CE Mark - full compliance with LVD and EMC directives; Worldwide safety standards - IEC60950, EN60950, UL60950, Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55022 Class B, FCC Class B, CISPR22 Class B, CCC, NOM-1 NYCE; MTBF - over 200,000 hours at 25°C ambient condition. | |

| | | | |
|---|---|---|---|
| **HP 65W EM Smart AC Adapter** | **Dimensions** | 4.98 x 1.97 x 1.18 in (12.65 x 5.0 x 3.0 cm) | |
| | **Weight** | 0.62 lb (300 g) max | |
| | **Input** | 90 to 265 VAC | |
| | | **Input Efficiency** | 87% min at 115 VAC |
| | | **Input frequency range** | 47 to 63 Hz |
| | | **Input AC current** | 1.7 A at 90 VAC |
| | **Output** | **Output power** | 65W |
| | | **DC output** | 19.5V |
| | | **Hold-up time** | 5 msec at 115 VAC input |
| | | **Output current limit** | <11A, Over voltage protection- 29V max automatic shutdown |
| | **Connector** | 3 pin/grounded, mates with 4.5mm barrel type Smart ID DC connector | |
| | **Environmental Design** | **Operating temperature** | 32° to 95° F (0° to 35° C) |

| | | |
|---|---|---|
| **Non-operating (storage) temperature** | -4° to 185° F (-20° to 85° C) | |
| **Altitude** | 0 to 16,405 ft (0 to 5,000 m) | |
| **Humidity** | 20% to 95% | |
| **Storage Humidity** | 10% to 95% | |
| **EMI and Safety Certifications** | CE Mark - full compliance with LVD and EMC directives; Worldwide safety standards - IEC60950, EN60950, UL60950, Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55022 Class B, FCC Class B, CISPR22 Class B, CCC, NOM-1 NYCE; MTBF - over 200,000 hours at 25℃ ambient condition. | |

**Primary Battery**

**3-cell HP Long Life (24WHr) Lithium-Ion Polymer**

| | | |
|---|---|---|
| **Dimensions** (H x W x L) | 7.8 x 4.01 x 0.3 in(19.89x10.28x0.84 cm) | |
| **Weight** | 180 g | |
| **Cells/Type** | 3-cell Lithium-Ion Polymer | |
| **Energy** | Voltage | 11.1 |
| | Amp-hour capacity | 2.2 Ah |
| | Watt-hour capacity | 24Wh |
| **Temperature** | Operating (Charging) | 32° to 113° F (0° to 45° C) |
| | Operating (Discharging) | 14° to 140° F(-10° to 50° C) |
| | Non-operating | -4° to 140° F (-20° to 50° C) |
| **Battery Re-Charge Time** | **System in OFF or Standby Mode** | 3 hours |
| **Fuel Gauge LED** | No | |
| **Warranty** | 1 year or 3 years* *Battery warranty depends on the platform warranty. | |
| **Optional Travel Battery Available** | No | |

**3-cell HP Long Life (50 WHr) Lithium-Ion Polymer**

| | | |
|---|---|---|
| **Dimensions** (H x W x L) | 7.8 x 4.01 x 0.3 in(19.89x10.28x0.84 cm) | |
| **Weight** | 280 g | |
| **Cells/Type** | 3-cell Lithium-Ion Polymer | |
| **Energy** | Voltage | 11.1 |
| | Amp-hour capacity | 4.504Ah |
| | Watt-hour capacity | 50Wh |
| **Temperature** | Operating (Charging) | 32° to 113° F (0° to 45° C) |
| | Operating (Discharging) | 14° to 140° F(-10° to 60° C) |

| | | |
|---|---|---|
| | Non-operating | -4° to 140° F (-20° to 60° C) |
| **Battery Re-Charge Time** | **System in OFF or Standby Mode** | 3 hours |
| **Fuel Gauge LED** | No | |
| **Warranty** | 1 year or 3 years* | |
| | *Battery warranty depends on the platform warranty. | |
| **Optional Travel Battery Available** | No | |

## ENVIRONMENTAL
TBD

## Country of Origin

China

## Options and Accessories (sold separately and availability may vary by country)

| Type | Description | Part # |
|------|-------------|--------|
| | HP Slim Ultrabook Messenger (up to 15.6" x .88"/22/5mm) | F3W14AA |
| *Cases* | HP Slim Ultrabook Top Load (up to 15.6" x .88"/22/5mm) | F3W15AA |
| *Docking* | HP 3001pr USB 3 Port Replicator | F3S42AA |
| | HP 3005pr USB 3.0 Port Replicator | H1L08AA#xxx |
| | HP 2013 UltraSlim Docking Station | D9Y32AA#xxx |
| | HP Universal Port Replicator | E6D70AA#xxx |
| | HP Display and Notebook Stand | AW662AA |
| *Input/Output – Mice* | HP Comfort Grip Wireless Mouse | H2L63AA |
| | HP X4000b Bluetooth Mouse | H3T50AA#xxx |
| | HP 3-Button USB Laser Mouse | H4B81AA |
| | HP Ultra Mobile Wireless Mouse | H6F25AA#xxx |
| | HP Slim Bluetooth Mouse | F3J92AA#xxx |
| *Input/Output – Keyboards* | HP Stylish USB Keyboard and Mouse | H4B80AA#xxx |
| | HP Stylish Wireless Keyboard and Mouse | H4B79AA#xxx |
| | HP USB Essential Keyboard and Mouse | H6L29AA |
| | HP 2.4 GHz Keyboard and Mouse | G1K29AA#xxx |
| *Input/Output – Adapters* | HP Wireless Display Adapter | J1V25AA#xxx |
| | USB Graphics Adapter Dual output | C5U89AA |
| | DisplayPort to VGA | F7W97AA |
| | DisplayPort to DVI Adapter | F7W96AA |
| | DisplayPort to HDMI Cable | F3W43AA |
| *Power* | HP 65W Slim AC Adapter | H6Y82AA#xxx |
| | HP 90W Slim AC Adapter | H6Y83AA#xxx |
| | HP 90W Slim Combo AC Adapter w/USB | H6Y84AA#xxx |
| | HP 45W Smart AC Adapter | H6Y88AA#xxx |
| | HP 65W Smart AC Adapter | H6Y89AA#xxx |
| | HP 90W Smart AC Adapter | H6Y90AA#xxx |
| | 90W Smart AC/Auto/Air Combo Adapter | AJ652AA#xxx |
| | 90W Smart Auto/Truck Adapter | ED493AA |
| *Batteries* | HP CA06XL Notebook Battery | E7U21AA |
| *Security* | HP Docking Station Cable Lock | AU656AA#XXX |
| | HP UltraSlim Keyed Cable Lock | H4D73AA |
| *Storage - External Storage* | HP USB External DVDRW Drive | F2B56AA |
| *Misc.* | HP 15.6" Notebook PC Privacy Filter | J7H71AA |
| *Displays* | HP EliteDisplay S231d 23-in IPS LED BLU Notebook Docking Monitor | F3J72AA |